A*STAR and King's College London PhD Studentships October 2023 Entry

Contents

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When choosing a project from this catalogue in the funding section & research proposal section of the online application form, please enter the funding code that corresponds to the theme of your first project choice:

1. Cells, Molecules and the Basis of Health and Disease: **THEME1_2023**
2. Neuroscience and Mental Health: **THEME2_2023**

Important dates:

Date	Application Stage
Deadline for application	Sunday 5th February 2023, midnight
Application Outcome	Week commencing 13th March 2023
Interviews	Week commencing 27th March 2023
Interview Outcomes	By Friday 31st March 2023
Acceptance of studentship offer	By 14th April 2023
Start Date	October 2023

The 2023/24 studentships will commence in October 2023. For further information or queries relating to the application process, please contact: doctoralstudies@kcl.ac.uk.

Projects listed in this catalogue are subject to amendments, candidates invited to interview will have the opportunity to discuss projects in further detail.

THEME1: Cells, Molecules and the Basis of Health and Disease

1.1 Dissecting age-related changes to tissue regeneration in a zebrafish model by live cell imaging and spatial transcriptomics.

Co-Supervisor 1A: Dr Robert Knight

Faculty: Faculty of Dentistry, Oral & Craniofacial Sciences

E-mail: robert.knight@kcl.ac.uk

Website: https://www.kcl.ac.uk/research/knight-group

Co-Supervisor 1B: Kok Hao Chen

Research Institute: Genome Institute of Singapore

Email: chenkh@gis.a-star.edu.sg

Website: https://khchenlab.github.io

Project Description:

Ageing has a profound impact on society due to increased health burdens. Physical frailty and impaired regeneration are hallmarks of ageing across all species, reflecting a conserved ageing programme. Despite identifying genes showing age-associated changes, it is not clear how these translate to altered cell function in living animals. This is important to establish as multiple cell types are involved in maintaining and regenerating tissues including immune cells, connective tissue cells and resident stem cells. The aim of this project is to identify ageing-associated genes that are important for muscle stem cell function that will enable us to search for therapeutics to ameliorate age-related decline. Objectives include 1) identification of ageing-associated gene expression changes in specific cell populations within muscle and 2) functional evaluation of candidate ageing-associated genes during homeostasis and regeneration. These will be achieved by defining molecular profiles in ageing that are associated with altered cell behaviour and function, then functionally test genes using CRISPR/Cas9 mutagenesis. To visualise cell behaviour in the context of ageing this project will utilise fluorescent microscopy in a zebrafish genetic model of ageing. Telomerase mutants shows premature ageing, similar to humans and have an impaired regenerative response at larval stages. In parallel gene activity in individual cells of the regenerating muscle will be profiled by an advanced method that enables visualisation of which genes are active in which cells. This will identify genes driving age-associated changes that can be related to cell function during regeneration, thus providing the basis for designing anti-ageing therapeutics.

Two representative publications from supervisors:

Sultan, S.H.A., C. Dyer, and Knight, R. D. Notch Signaling Regulates Muscle Stem Cell Homeostasis and Regeneration in a Teleost Fish. Frontiers in Cell and Developmental Biology, 2021. 9(2501). https://doi.org/10.3389/fcell.2021.726281

Goh, J. J. L.*, Chou, N.*, Seow, W. Y., Ha, N., Cheng, C. P. P., Chang, Y., Zhao, Z. W., Chen, K. H. Highly specific multiplexed RNA imaging in tissues with split-FISH. Nature Methods, (2020) https://doi.org/10.1038/s41592-020-0858-0.

THEME2: Neuroscience and Mental Health

1.2 Motivation to model others' minds: the importance of cognitive motivation for mental state understanding in early adolescence.

Co-Supervisor 1A: Dr Caroline Catmur

Faculty: Institute of Psychiatry, Psychology & Neuroscience

E-mail: caroline.catmur@kcl.ac.uk

Website: https://kclpure.kcl.ac.uk/portal/caroline.catmur.html

Co-Supervisor 1B: Dr Yuen Siang Ang and Professor Michael Meaney

Research Institute: Social and Cognitive Computing, Institute of High Performance Computing

Email: angys@ihpc.a-star.edu.sg

Website: https://yuensiangang.github.io

Project Description:

Understanding others' mental states allows individuals to obtain the social support necessary for mental wellbeing. But some people struggle to understand others. Early adolescence is a period of intense social change, making this a crucial developmental period for mental state understanding. Identification of factors influencing mental state inference during adolescence may lead to improved predictors and treatments for mental ill-health in later life. The factors impacting upon individuals' motivation to engage in mental state understanding are not well understood, and few measures of this motivation exist. This project combines the first supervisor's research into how humans model others' minds, with the second supervisor's expertise in cognitive motivation, to measure motivation to engage in mental state inference. Following development and validation of the 'Motivation to Model Minds' measure (months 1-12, London), the student will assess this ability in the GUSTO cohort of 14-year-old youths (months 13-33, Singapore). We will capitalise on the exceptionally rich datasets that have been collected from this cohort, allowing us to identify early-life factors which impact on the motivation to model others' minds in adolescence, along with measuring associations during adolescence between the motivation to model minds and other social and cognitive abilities, and mental wellbeing. Months 34-48, in London, will focus on writing up the thesis and disseminating the project results. This project involves methodologies from experimental psychology and computational modelling, along with big data analysis techniques. This makes it an exciting opportunity for the student to develop a range of highly transferable skills as part of their studies.

Two representative publications from supervisors:

Conway, J. R., Coll, M. P., Cuve, H. C., Koletsi, S., Bronitt, N., Catmur, C., & Bird, G. (2020). Understanding how minds vary relates to skill in inferring mental states, personality, and intelligence. Journal of Experimental Psychology: General, 149(6), 1032–1047. https://doi.org/10.1037/xge0000704

Ang, Y. S., Gelda, S. E., & Pizzagalli, D. A. (2022). Cognitive effort-based decision-making in major depressive disorder. Psychological Medicine, 1–8. https://doi.org/10.1017/S0033291722000964

2.2 Exploring the association between perinatal maternal mental health, infant brain development and childhood mental health outcomes – a multi-context study.

Co-Supervisor 1A: Dr Chiara Nosarti

Faculty: Institute of Psychiatry, Psychology & Neuroscience

E-mail: chiara.nosarti@kcl.ac.uk

Website: https://www.kcl.ac.uk/people/chiara-nosarti

Co-Supervisor 1B: Professor Michael Meaney and Dr Tan Ai Peng

Research Institute: Translational Neuroscience, SICS

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Website: https://www.a-star.edu.sg/sics/our-people/our-leaders

Project Description:

During or after pregnancy, up to 20% of women will experience mental health problems such as depression and anxiety. Poor maternal mental health has been associated with an increased risk for adverse socio-emotional, behavioural and psychiatric outcomes in offspring. While the exact biological mechanism conferring this elevated risk remains poorly understood, suboptimal offspring outcomes could be at least partly explained by differences in neurodevelopment: the life-long process by which the brain grows and adapts to change. This study will evaluate data from typically and atypically developing children (age 2-11 years, n~2000), recruited in the UK and in Singapore, collected from birth and throughout childhood at different time points. The overarching aim of the study is to investigate brain structural and functional connectivity alterations as mediators between maternal mental ill-health and child vulnerability to developing psychopathology. An increased understanding of how specific brain structural and functional alterations influence the known links between perinatal maternal mental health and early child development will elucidate the mechanisms underlying the transgenerational transmission of mental health disorders. Furthermore, the study of long-term effects of maternal mental health on child behaviour in diverse geographical settings may inform context-specific interventions to support maternal mental health and promote child development. The student will receive an unparalleled training combining neuroimaging and neuroinformatic skills with advanced statistics and expertise in perinatal mental health and child development. Training will be provided both (i) directly by the project, and (ii) by wider participation in the research groups.

Two representative publications from supervisors:

Kleine, I., Vamvakas, G., Lautarescu, A., Falconer, S., Chew, A., Counsell, S., Pickles, A., Edwards, D., & https://doi.org/10.1136/bmjopen-2021-058540

Wei, D., Zhang, H., Broekman, B. F. P., Chong, Y., Shek, L. P., Yap, F., Tan, K., Gluckman, P. D., Meaney, M. J., Fortier, M. V., Qiu, A. (2022). Cortical Development Mediates Association of Prenatal Maternal Depressive Symptoms and Child Reward Sensitivity: A Longitudinal Study. Journal of the American Academy of Child and Adolescent Psychiatry, 61 (3), pp. 392-401. doi: 10.1016/j.jaac.2021.05.021.

3.2 Utilising vocal biomarkers and artificial intelligence to model symptoms of central nervous system disorders.

Co-Supervisor 1A: Dr Nicholas Cummins and Professor Richard Dobson

Faculty: Institute of Psychiatry, Psychology & Neuroscience

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Website: https://www.kcl.ac.uk/people/nicholas-cummins

Co-Supervisor 1B: Dr Nancy F. Chen

Research Institute: Institute for Infocomm Research (I2R); Centre for Frontier AI Research (CFAR)

Email: nfychen@i2r.a-star.edu.sg

Website: https://www.a-star.edu.sg/cfar/about-cfar/our-team/dr-nancy-f-chen

Project Description:

Our voices are a window into our mental health when combined with powerful artificial intelligence analyses; they contain valuable clues to how well our brain and the speech muscles it controls are working. Already, researchers have been able to assess the severity of health conditions such as depression from speech recordings made in tightly controlled conditions. In the future, the analysis of speech recorded on smartphones in everyday life could meet a large unmet need for convenient, objective tools that monitor symptom severity, increasing access to health services. However, to reliably monitor changes linked to our mental health, we first need to explore how best to develop robust and reliable machine learning models to characterise and track these changes. This project will utilise data resources collected as part of the major European Innovative Medicines Initiative (IMI2) Remote Assessment of Disease and Relapse – Central Nervous System (RADAR-CNS) programme, a longitudinal cohort study examining the utility of multi-parametric RMT to predict changes in symptoms and relapse in people with major depressive disorder (MDD), Multiple Sclerosis (MS) or epilepsy. The supervisory team contains expertise across the domain of speech processing and machine learning, with relevant training opportunities provided through the Department of Biostatistics and Health Informatics and King's College London. In short, this project represents a unique chance to undertake novel research with leading experts in the field, whose outputs will represent a clear step change in the development of speech phenotype for use in healthcare and research settings.

Two representative publications from supervisors:

S. Fara, S. Goria, E. Molimpakis, and N. Cummins. "Speech and the n-Back task as a lens into depression. How combining both may allow us to isolate different core symptoms of depression," Proc. Interspeech 2022, 2022, pp 1911-1915, doi: 10.21437/Interspeech.2022-10393.

Z. Liu, A. Ng, S. Lee, A. T. Aw and N. F. Chen, "Topic-Aware Pointer-Generator Networks for Summarising Spoken Conversations," 2019 IEEE Automatic Speech Recognition and Understanding Workshop (ASRU), 2019, pp. 814-821, doi: 10.1109/ASRU46091.2019.9003764.